TECHNICAL INFORMATION ON BUILDING MATERIALS

TIBM - 46

FOR USE IN THE DESIGN OF LOW-COST HOUSING

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THE NATIONAL BUREAU OF STANDARDS
UNITED STATES DEPARTMENT OF COMMERCE
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VOLATILE PAINT AND VARNISH THINNERS[1]

This is chiefly a digest of sections of applicable Federal Specifications[2] and of the following publications of the National Bureau of Standards dealing with turpentine, substitutes for turpentine, composite vehicles, and less important volatile thinners.

Circular No. C69, "Paint and Varnish", (November 17, 1917).[3]

Technologic Paper No. T274, "Use of United States Government Specification Paints and Paint Materials", (December 15, 1924),[4] by P. H. Walker and E. F. Hickson.

Turpentine

Production and Types: Turpentine, a valuable and widely used volatile thinner for oil paints and most oil-resin varnishes, is produced (a) by distillation of resin from the pine-tree yielding "gum spirits of turpentine", (b) by either steam distillation or destructive distillation of the pine wood, yielding "wood turpentine", (c) in the form of sulphate wood turpentine, a by-product of the paper pulp industry.

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[1] Volatile thinners consist of that portion of paint, water excepted, which is volatile in a current of steam at atmospheric pressure.

[2] Specifications adopted by the Federal Specifications Executive Committee and approved by the Director of Procurement, Treasury Department, for use of all departments and establishments of the Government. Copies of Federal Specifications mentioned in this digest may be obtained from the Superintendent of Documents, Washington, D. C. (Price 5 cents)

[3] Out of print and not available by purchase, but may be consulted in Government depository libraries.

[4] Available from the Superintendent of Documents, Washington, D. C. (Price 10 cents)

Properties and Use: Turpentine has excellent "flatting" and good solvent properties. It has excellent penetrating qualities, evaporates in a satisfactory manner, and is the best solvent for oils, etc., occurring in woods. Therefore, it should be used in priming coats on new wood. There is no objection to using it in all subsequent coats. When paints containing varnish require additional volatile thinner, it is safest to use turpentine.

Federal Specifications: See LLL-T-791a, "Turpentine; (For) Paint, Type I", covering what is known as gum spirits of turpentine, steam-distilled wood turpentine, and sulphate wood turpentine; and LLL-T-792, "Turpentine; (For) Paint, Type II", covering what is known as destructively distilled wood turpentine.

There is practically no difference in evaporation of the two types. However, there is evidence that wood turpentine in certain cases is a somewhat better solvent than gum spirits. Differences in solvent power are immaterial in thinning oil paints, but in the manufacture of certain varnishes they are important. Turpentine has proved to be very helpful in improving the brushing properties of some of the new synthetic resin varnishes and enamels. In specifying wood turpentine, it is advisable to agree upon a standard sample for odor.

Turpentine Substitutes

Substitutes for turpentine are usually prepared from suitable fractions of petroleums. They vary greatly in specific gravity, flash point, solvent power, etc. Therefore, selection must be based on requirements. Generally speaking, they must be almost completely volatilized during the drying process and possess suitable solvent power, causing no precipitation of "gum" or polymerized oil in the paint or varnish.

Petroleum Spirits (Mineral Spirits): Although different fractions from the same petroleum vary greatly in solvent power and while there is little evidence to show what, if any, effect the nature of crude petroleum has on the solvent power of mineral spirits made from it, substitutes prepared from an asphaltic base petroleum (Texas) are believed to have better solvent powers than those prepared from a paraffin base petroleum (Pennsylvania).

Mineral spirits is not as good a solvent as turpentine, but can be used in many cases. The only marked difference between products containing a petroleum distillate, possessing proper volatilization and solvent power, and those containing turpentine, is found in the flowing or spreading properties. The influence of the thinner on drying, and the nature of dried film have never been satisfactorily determined.

The recently developed hydrogenated naphthas have proved to be valuable in utilizing synthetic resins. These naphthas are much better solvents than the ordinary mineral spirits.

Federal Specification: See TT-T-291, "Thinner; Paint, Volatile Mineral Spirits" covering that grade of petroleum distillate, known as mineral spirits or petroleum spirits for use in paint, which evaporates in a manner

similar to turpentine. In thinning varnishes with mineral spirits it is, necessary to make sure that the particular varnish being used will mix readily with them.

Solvent Naphtha (Coal-Tar Naphtha): The distillate of light oil from coal-tar, boiling principally between 130°C and 160°C, is a good solvent. It is extensively used, especially in bituminous paints and four-hour type varnishes and enamels, to dissolve synthetic resins, to increase the solvent power of petroleum naphthas, and to keep in solution highly blown or kettled oils. Solvent naphtha is sometimes called 160° benzol.

Composite Vehicle[1]

Federal Specification: See TT-T-271, "Thinner; Paint, (For) Semipaste Paints", covering one grade of a composite vehicle which contains in one liquid, drying oil, drier, and volatile thinner intended for use in cheaper paints than straight linseed oil paints. It is used for single-coat work, generally in repainting jobs, and for semipaste paints when the use of straight linseed oil is not justified. Although paints made with this composite vehicle are inferior to straight linseed oil paints, they frequently give good service.

Less Important Volatile Thinners

Benzene (benzol), toluene (toluol), and xylene (xylol), definite compounds of lower boiling points than solvent naphtha, also derived from the light oil of coal-tar, are sometimes used as volatile thinners. Benzene and toluene are used as volatile thinners particularly in cellulose ester lacquers.

Grain, denatured, and wood alcohol are used principally in shellac varnishes; amyl acetate, amyl alcohol, butyl acetate, and butyl alcohol in nitro-cellulose lacquers.

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[1] Such preparations are sometimes called "Thinning Mixtures for Paint", and are also offered under a variety of trade names, such as "Japan Oil", "Paint Oil", "Linseed Oil Substitute", etc. The term "Linseed Oil Substitute" should not be used for composite vehicle, for while such materials may have decided merit, they are not substitutes for linseed oil.